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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(54) Title:</b> PROXY FOR VIDEO ON DEMAND SERVER CONTROL <b>(57) Abstract</b> <p>A video on demand system includes a head-end coupled through a proxy server to plural client terminals. The proxy server performs (or cooperates with another component in performing) various functions, including user interface definition, security, system administration (e.g. channel management, load distribution, and failover), and protocol translation.</p>		

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## PROXY FOR VIDEO ON DEMAND SERVER CONTROL

### Field of the Invention

5 The present invention relates generally to interactive entertainment systems, and more particularly relates to the use of a processor between the head-end and the clients, to which various processing tasks can advantageously be delegated.

### Background and Summary of the Invention

10 The popularity of the Internet, a well-known, global network of cooperative interconnected computer networks, combined with the widespread availability of low-cost broadband networking and advanced digital compression techniques, has spurred the growth of what is known as interactive television. Interactive television provides viewers with compelling Internet and video content on their home television equipped only with a simple internet-television terminal, such as those pioneered by WebTV  
15 Networks, Inc. WebTV terminals are akin to the set-top boxes associated with a cable television network, and work in conjunction with a standard home television set to display both Internet and traditional television content, so that persons without access to a personal computer are able to access the Internet.

20 The ability to combine video content with the interactive features of interactive television has spawned numerous providers of video-on-demand applications for interactive entertainment systems. Currently, the typical video-on-demand application for interactive television consists of plural video-on-demand clients on terminals attached to the viewer's home television, and one or more video-on-demand servers connected to the video head-end. The user interface of current video-on-demand  
25 applications is contained entirely in the video-on-demand client, and provides commands to the video-on-demand server to select, start or stop and pay for the video played on the viewer's home television. Typically, the video-on-demand server provides access to the video content available for transmission, whereas the client controls the selection of the video and the payment mechanism.

30 There are several different brands of video-on-demand applications available on the market today. Three examples are Seachange, Vivid and Microsoft's Netshow Theater. In view of the popularity of the video-on-demand feature of interactive television, there will likely be many more video-on-demand servers developed in the near future.

One of the difficulties with the proliferation of competing video-on-demand applications is the lack of an industry standard communications protocol. The protocol controls the communication between the video-on-demand server and the various video-on-demand clients on the interactive television network. The challenge in a  
5 video-on-demand application is that it must be capable of managing not only the download of digital video data to the client, but also the transmission of control data to and from the client relating to system administration (e.g. channel assignment data, billing information, etc.).

Currently, most video-on-demand servers use a proprietary communications  
10 protocol unique to that video-on-demand server. Problems arise when the protocols used to control the video-on-demand servers aren't understood (are incompatible with) the protocols supported by the various video-on-demand clients. Examples of some of the diverse protocols in use today are DAVEC (a cable modem standard), DSMTC (used by certain video head-ends), and RTSP (an industry-proposed standard that has  
15 met with little success). The use of incompatible protocols has limited expansion options available to existing video on demand systems.

Moreover, the current configuration of most interactive video systems provide incomplete failover recoverability since the back-end servers on which most video-on-demand servers reside necessarily cannot completely manage their own failure.

20 Current video-on-demand servers use a limiting "segmented channel" model to transmit the video data. Under this model, each viewer is assigned a dedicated video channel. This greatly limits flexibility and expansion options.

Various embodiments of the present invention redress these and other shortcomings of the prior art by interposing a middle tier in the interactive video  
25 system. This middle tier -- commonly a proxy server -- provides various services, including protocol translation, system administration (dynamic channel assignment, load distribution, and failover), dynamic error-patching, and security.

According to one aspect, the invention provides an improved system and method for delivering a video-on-demand feature to remote clients of an interactive  
30 television network. The system and method employ the proxy server to reconfigure the components of a video-on-demand application into a flexible multi-tiered configuration, and to redistribute the functions of those components to the proxy server so as to enhance the performance, reliability, security, scalability and other features of the system.

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One implementation of the present invention includes one or more proxy servers interposed between one or more video-on-demand servers and one or more video-on-demand clients. The proxy server includes a protocol translation component, a user interface component, a channel management component, a loadsharing  
5 component, a failover component and a security component.

The translation component translates, if necessary, the communication protocols used by the video-on-demand server and video-on-demand client, and fixes -- on-the-fly -- certain errors in those protocols. The user interface component distributes the user interface between the video-on-demand server and video-on-demand client  
10 and provides user interface enhancements. The channel management component manages the assignment of transmission channels to video-on-demand clients. The failover component redirects requests to failed video-on-demand servers to secondary/alternate servers. The loadsharing component manages the load between the video-on-demand servers and possibly one or more other proxy servers in a given  
15 server configuration of the interactive television network at the head-end. The security component provides a uniform security framework that previously was located in each individual video-on-demand server at the head-end.

In one implementation of the method and system, a promotional component is also provided to initiate delivery of customized promotional content from the proxy  
20 server to the video-on-demand client.

The foregoing and other features and advantages of the present invention will be more readily apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

#### 25 Brief Description of the Drawings

Figure 1 is a block diagram of an interactive video system that can be used in accordance with the present invention.

Figure 2 is a block diagram of the entertainment video head-end of Figure 1.

Figure 3 is a block diagram of video-on-demand components.

30 Figure 4 is a block diagram of a configuration of a video-on-demand application.

Figure 5 is a block diagram of a proxy server of Figure 1.

### Detailed Description

Referring to Figure 1, an exemplary interactive entertainment system 10 according to one embodiment of the present invention includes an entertainment head-end 12, one or more proxy servers 24, and one or more client terminals 14  
5 intercoupled through a network 16. The proxy servers 24 are computers interposed in a middle tier between the head-end 12 and the client terminals 14 to perform various interactive video system control and user interface (UI) functions.

The network 16 typically comprises coaxial cable or optical fiber 18, extending from the head-end 12 to distribution nodes 20 within various neighborhoods. From the  
10 distribution nodes, further cables 22 couple to individual subscriber premises.

The proxy server 24 is interposed in a logical TCP/IP control channel 27 between the head-end and clients. While the control signals and the entertainment are physically conveyed on the same cable 18, they are shown separately in Fig. 1 for conceptual clarity.

15 As shown in Figure 2, the entertainment head-end 12 includes the components typically associated with a cable television head-end installation, e.g. satellite receivers 26 for receiving satellite broadcasts and producing corresponding baseband analog video signals. Additionally, head-end 12 includes fast digital disk arrays and/or optical storage 28 for storage of MPEG-encoded digital video for on-demand delivery. Head-  
20 end 12 also includes one or more interactive services servers 30, which output HTML-based programming (e.g. customized news, celebrity chat, interactive jukebox, and interactive games), as further detailed in the related applications by White et al.

The illustrated head-end 12 is shown as including the proxy servers 24. In some implementations, such servers are co-located at the head-end; in others, the  
25 proxy servers are remote from the head-end.

The transmission of the various forms of data from head-end 12 over the network 16 is straightforward. As is familiar to those skilled in the video arts, the analog video is commonly distributed on 6 MHz channels, beginning at 52 MHz and extending upwardly. The digital video can be encoded on a carrier for transmission  
30 within one of these conventional broadcast channels, or can be modulated at one or more other unused frequencies. Statistical multiplexing is desirably employed to transmit plural channels of digitized video with reduced bandwidth. The HTML-based interactive services and the control data can be transmitted using a conventional protocol (e.g. TCP/IP) and modulated onto a suitable carrier frequency for distribution  
35 over the network. After modulation to appropriate distribution frequencies by

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modulators 34, these various signals are combined by an RF combiner 36 for distribution over the network 16.

Referring to the top portion of Figure 3, a typical prior art video-on-demand system includes a client terminal 14 intercoupled to a video-on-demand server 30 in head-end 12 through a network 16. The client terminal 14 includes a client user interface (UI) 56 to perform various interactive video system control functions, such as video selection, start, stop and payment. The video-on-demand back-end server 30 is a computer, usually co-located with the interactive services server 30, and may include a failover component 70, a loadsharing component 74 and a security component 76 to perform various interactive video system control functions such as receiving and transmitting control data relating to system administration (e.g. channel assignment data, billing information, etc.), error recovery and load management.

Referring to the bottom portion of Figure 3, the illustrated implementation of the present invention interposes a proxy server 24 between the client terminal 14 and the video-on-demand server 30. In the new configuration the UI function is now shared between the client UI 56 on the client terminal 14 and the server UI 78 on the proxy server 24. The video-on-demand back-end server 30 no longer contains the failover component 70, loadsharing component 74 or security component 76. Those functions have been distributed instead to the proxy server 24.

The top portion of Fig. 4 shows another representation of a prior art video-on-demand system, and the lower portion shows an embodiment of the present invention. As is familiar to those skilled in the relevant arts, a security firewall 80 is commonly provided to limit access to the video-on-demand back-end servers 30 (the bi-directional control data 82 is typically transmitted over an unsecured IP link).

Focusing on the bottom portion of Figure 4, the illustrated embodiment interposes the proxy server 24 between the client 14 and the video-on-demand back-end server 30. The introduction of the proxy server 24 greatly enhances the configurability of the interactive video system. The back-end servers still transmit the MPEG encoded video data 84 directly to the RF combiners 36. But by separately managing the control data 82 flowing between the clients 14 and multiple back end servers 30, the proxy server 24 serves as an additional security layer -- insulating the back end video-on-demand servers 30 from the IP link over which the control data 82 is transmitted. Configured in this way, the back-end video-on-demand servers 30 may be used more as a commodity available to one or more proxy servers 24 in the

transmission of MPEG encoded video data 84 from the back-end server 30 to the client terminal 14.

Moreover, the proxy server 24 can perform various administrative management functions, such as managing channel assignments for video-on-demand transmission.

5 Here a distinction should be drawn between two types of "channels." The first, termed a "transmission channel," refers to an actual frequency channel (e.g. 52 - 58 MHz) that is used to relay programming from the head-end 12 to the client terminal 14 over the network 16. The second, termed a "viewer channel," refers to the moniker (e.g. MSNBC, CNN, GAME, CHAT, VIDEO) by which a user distinguishes  
10 different programming. The mapping between viewer and transmission channels is determined by the system, e.g. proxy server 24.

The VIDEO channel is a viewer channel -- it is the channel to which the viewer switches to receive video-on-demand programming. The frequency over which this programming is delivered is not important to the viewer. Different transmission  
15 channels may be available for use at different times, depending system resource usage (e.g. other viewers' video-on-demand usage). One day the 108-114 MHz transmission channel might be used to relay on-demand video to a subscriber. The next day, the 114-120 MHz transmission channel might be used instead. Data indicating the assignment of transmission channels-to-viewer channels is periodically sent as control  
20 data 82 between the proxy server 24 and the client terminal 14.

If a viewer interrupts delivery of an on-demand video, e.g. by switching to another channel or pressing STOP on a control panel (as further detailed in the related application by White et al), transmission of the video is suspended. The proxy maintains the assignment of the original transmission channel to that client briefly, but  
25 if the video is not promptly resumed, that transmission channel is returned by the proxy server 24 to a pool of available transmission channels. If the viewer thereafter returns to the VIDEO channel (or presses PLAY on a control panel), this fact is communicated to the proxy server 24 by the client terminal over the control data link. The proxy server 24 then identifies an available transmission channel and instructs the  
30 client terminal 14 to tune to that channel. (This retuning is transparent to the viewer, whose channel selection remains at the VIDEO viewer channel.) The proxy server 24 similarly instructs the video server 30 to resume transmission of the requested video from the point of interruption, or just before the point of interruption (for purposes of viewing context), this time modulating it on the newly-assigned channel. Video



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delivery resumes. However, unknown to the viewer, the video delivery resumes on a transmission frequency different than that originally used.

In addition to managing system resources such as transmission channels, the proxy server 24 also serves as a convenient control point for administering certain UI functions on the client terminals 14. Thus, for example, a video-selection UI by which a viewer selects a desired video from a library of available videos can be defined at the proxy server 24 (which is in constant communication with the back end server's video library data), and distributed to the clients 14 as needed. (These UI elements at the proxy server include HTML instructions that are sent to the client for rendering to produce the desired user interface screens and controls.)

Similarly, by controlling from the proxy server certain client UI elements (e.g. buttons, controls, graphics, labels, and other screen customizations presented to the viewer on the client terminal), it is possible to update the UI elements with new features, or to apply changes to reflect new promotional features or different branding, as needed. For example, the logo of a particular video-on-demand server may appear on a button on a UI screen presented to a viewer. The server UI 78 of the proxy server 24 can dynamically change that logo as it appears on the various client terminals 14 to reflect the branding of the various video-on-demand back-end servers 30 it controls.

In contrast, primitives defining other UIs are maintained at the client terminal 14. An example is a video playback UI, with PLAY, STOP, REWIND, etc., buttons. This UI is well defined and static, so there is less advantage to distributing its definition out to the proxy server.

A viewer operating the client terminal 14 is unaware of the origin of the UIs presented on the viewing screen. The viewer may invoke a video playback UI (originating at the client terminal) to stop playback of an on-demand video. After pressing STOP, the system may immediately present a further UI (originating at the proxy server) indicating that the viewer has electronic mail waiting, or indicating the time-remaining in the interrupted video.

Another function of the illustrated proxy server 24 is to effect protocol translation between the protocol employed by the client, and that employed by the server. As noted, there are a wide variety of such protocols. While new video-on-demand systems are commonly installed with a consistent client/server protocol, subsequent events can lead to changes. For example, by acquisition or otherwise, an operator of a video-on-demand system may inherit client terminals from another (non-

compatible) system. The provision of protocol translation in the proxy server facilitates integration of such non-compatible client terminals into the system. Similarly, upgrades to a video-on-demand system may entail substitution of a video server employing a different control protocol. Again, protocol translation by the proxy server facilitates integration of such new equipment.

Still another function of illustrated proxy server 24 is loadsharing and failover administration. In the loadsharing component 74, the proxy server 24 monitors the loads on the various video-on-demand back-end servers 30 under its control, and allocates the video-on-demand viewing load accordingly. (In an exemplary embodiment, the head-end includes several video servers. Currently popular movie titles may be replicated in several of the servers to accommodate their expected high demand. Older, classic films, in contrast, may be present on just one server.)

Loadsharing 74 works in conjunction with the failover 70 function, where the proxy server 24 redirects requests to failed back-end servers 30 to other available servers. In this way, the proxy server 24 enhances performance by managing what would likely be a catastrophic failure in the prior art configuration of video entertainment systems 10.

Yet another function of the illustrated proxy server 24 is to fix -- on-the-fly -- certain problems associated with either a client or a server. For example, a certain client may, in a particular circumstance, erroneously send two PLAY commands when only one should be sent. The proxy server can be programmed to look for such aberrant behavior, and pass on to the video server only a single PLAY command. Similarly, a video server may have a bug in a JPEG compression routine that causes certain image data transmitted from the server to be flawed, prompting a receiving client to fail. The proxy server can monitor the traffic from the server for such corrupted JPEG data, and can correct it before passing same to the client. (It will be recognized that this general capability is widely applicable, and is not limited to the particular bug-fixes given in these examples.)

Fig. 5 is a block diagram of an exemplary proxy server 24. The illustrated server includes a CPU 38, RAM memory 40, non-volatile memory 42, a user interface (UI) 78, and appropriate interfaces to the RF combiners 36 and back-end video-on-demand servers 30.

The CPU 38 can be any of several microprocessors, e.g. those available from Intel, AMD, Cyrix, Motorola, etc. Alternatively, the CPU 38 can be a custom device that optionally integrates one or more of the other components of proxy server 24.

The RAM memory 40 typically comprises 256K of EDO memory, but more or less memory, and/or memory of differing type, can alternatively be used.

The non-volatile memory 42 in the illustrated embodiment includes a ROM, EEPROM, or flash memory in which certain components of the server's operating system and applications software are stored. Additionally, the illustrated non-volatile memory 42 includes 4GB of magnetic disk storage. Software stored in this non-volatile memory (commonly transferred to the RAM memory for execution) causes the proxy server 24 to perform the various functions detailed earlier. (Such programming is well within the capabilities of artisans in this field, so is not belabored.)

Having described and illustrated the principles of our invention with reference to a preferred embodiment and various alternatives, it should be apparent that the invention is not limited to the detailed arrangements.

For example, while the detailed proxy server 24 performed a certain set of functions, in other embodiments such a server can perform a subset (or superset) of these functions.

While the disclosure particularly detailed the proxy server's 24 role in defining aspects of a visual UI presented on the client terminal 14, in other embodiments, the proxy can play a similar role with UIs of other types (e.g. gesture-interfaces, audio interfaces, tactile interfaces, etc.).

Reference was made to HTML. This term is meant to include not just Hypertext Markup Language per se, but also to encompass other graphical and/or video representation systems by which primitives can be combined to yield desired static or moving displays.

The illustrated embodiment employed a wired link to the interactive network, but other distribution arrangements (e.g. direct satellite broadcast, with telephone return channel) can likewise be used. Similarly, the dial-up link is not exclusive; other arrangements (e.g. MetroCOM, etc.) can be used, depending on the needs of the particular application.

Moreover, even a "wired" link to the interactive network needn't be of the sort particularly illustrated. With enhanced compression techniques and delivery technologies, other arrangements -- including plain old telephone service -- can alternatively be employed.

To provide a comprehensive disclosure without unduly lengthening this specification, applicants incorporate by reference the disclosure of patent 5,648,824,

which discloses additional details related to video-on-demand systems and related user interfaces.

While the foregoing discussion has detailed a complete system, it employs many inventive concepts – each of which is believed patentable apart from the system  
5 as a whole.

In view of the many different embodiments to which the above-described inventive concepts may be applied, it should be recognized that the detailed embodiments are illustrative only and should not be taken as limiting the scope of our invention. Rather, we claim as our invention all such modifications as come within the  
10 scope and spirit of the following claims, and equivalents thereto.

**WE CLAIM:**

1. A video system comprising a video-on-demand server and a remote client, the server employing a server communications protocol, the client employing a client communications protocol, the system further including a proxy interposed between the server and the client, the proxy including means for translating between the server and client communications protocols, wherein the server and client can communicate through the proxy even if the server and client protocols are different, and wherein change to either the server or client protocol can be accommodated by a change to the proxy rather than to the client or server, respectively.
2. The system of claim 1 wherein the proxy further includes means for translating between at least one of said client and server communications protocols and a third protocol different from said client and server communications protocols, wherein the same proxy can be used in different server/client environments.
3. The system of claim 1 wherein the proxy includes means for ameliorating aberrant behavior in at least one of said server or client.
4. The system of claim 3 wherein the proxy includes means for detecting a predetermined input communication in an input protocol, and issuing an output communication in an output protocol that does not exactly correspond to the input communication.
5. In a video-on-demand application including plural user terminals and an infrastructure linking the terminals to one or more video servers, a method comprising:
  - presenting a user interface on a screen associated with one of said terminals, the user interface comprising plural elements;
  - specifying a first group of user interface elements in accordance with first instructions stored in the user terminal; and
  - specifying a second group of user interface elements in accordance with second instructions received by the user terminal from the infrastructure.
6. The method of claim 5 further comprising providing a proxy as part of the infrastructure, and issuing said second instructions from the proxy.

7. The method of claim 5 wherein the first and second user interface elements are presented at different times.
8. The method of claim 5 wherein the first group of user interface elements include controls for video-on-demand playback, and the second group of user interface elements include controls for video-on-demand selection.
9. The method of claim 5 wherein the second instructions include graphic data, the method including using said graphic data for logo branding of the user interface.
10. The method of claim 5 comprising interrupting delivery of an on-demand video in response to a user command input through one of said first group of user interface elements, and presenting a screen display including at least one of said second group of user interface elements in response.
11. The method of claim 10 wherein said screen display indicates whether the viewer has electronic mail waiting.
12. The method of claim 10 wherein said screen display indicates time remaining for the interrupted on-demand video.
13. In a video-on-demand application having a client coupled to a server, the system including a user interface component, an improvement comprising interposing between the client and the server an intermediary processor, and distributing at least part of the user interface component between the client and the intermediary processor.
14. The system of claim 13 further including a security component, the method including distributing at least part of the security component to the intermediary processor.
15. The system of claim 13 further including a failover component, the method including distributing at least part of the failover component to the intermediary processor.

16. The system of claim 13 wherein the intermediary serves as a protocol converter between the client and server.

5           17. In a video-on-demand application including plural clients coupled to at least one video server through an infrastructure, the infrastructure defining plural transmission channels, the infrastructure further including an intermediary processor, a method comprising:

                  assigning a first transmission channel to a first client to transmit an on-demand  
10 video thereto;

                  assigning a second transmission channel to a second client to transmit an on-demand video thereto; and

                  employing the intermediary processor to manage said assignment of channels to clients.

15           18. The method of claim 17, including employing the intermediary processor to reassign the first client to a third transmission channel at a point between the beginning and end of the first client's on-demand video, so as to manage channel resources.

20           19. The method of claim 17 wherein the clients and server employ different communication protocols, and the intermediary processor effects conversion between said protocols.

25           20. In a video-on-demand application including plural clients coupled to a primary video server through an infrastructure, the infrastructure including a proxy, the system further comprising at least one backup video server, a method comprising:  
                  using said proxy as a firewall between the clients and the video servers; and  
                  also using said proxy to manage redirection of video sourcing from the primary  
30 video server to the backup video server in the event of failure of the primary video server.

                  21. The method of claim 20, further comprising using the proxy to specify at least a portion of a user interface presented on a client display.

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22. In a video-on-demand application including plural clients coupled to a video server through an infrastructure, the infrastructure including a proxy, the video server including plural video storage systems, a method comprising:

5 using said proxy as a firewall between the clients and the video servers; and  
also using said proxy to manage load distribution among said plural video storage systems.

23. The method of claim 22, further comprising using the proxy to specify at least a portion of a user interface presented on a client display.

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24. In a video-on-demand application including plural clients coupled to at least one video server through an infrastructure, an improvement comprising:

providing an intermediary processor in the infrastructure; and  
initiating delivery of promotional video to a client from the intermediary

15 processor.



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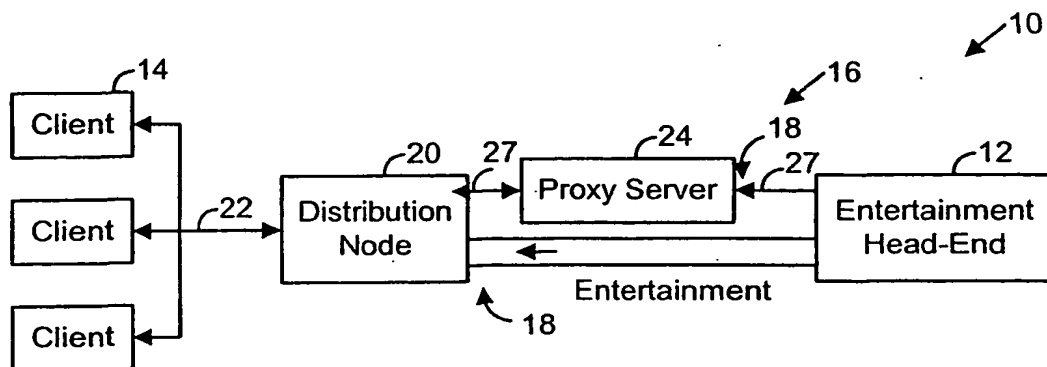


Fig. 1

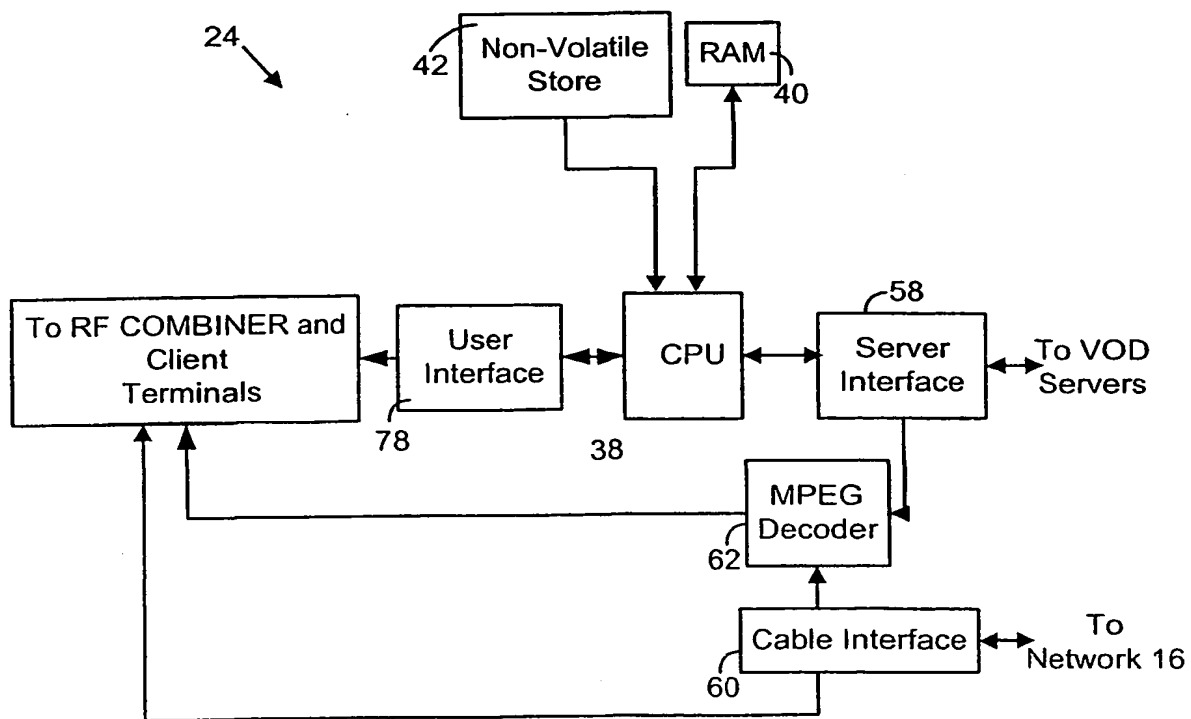
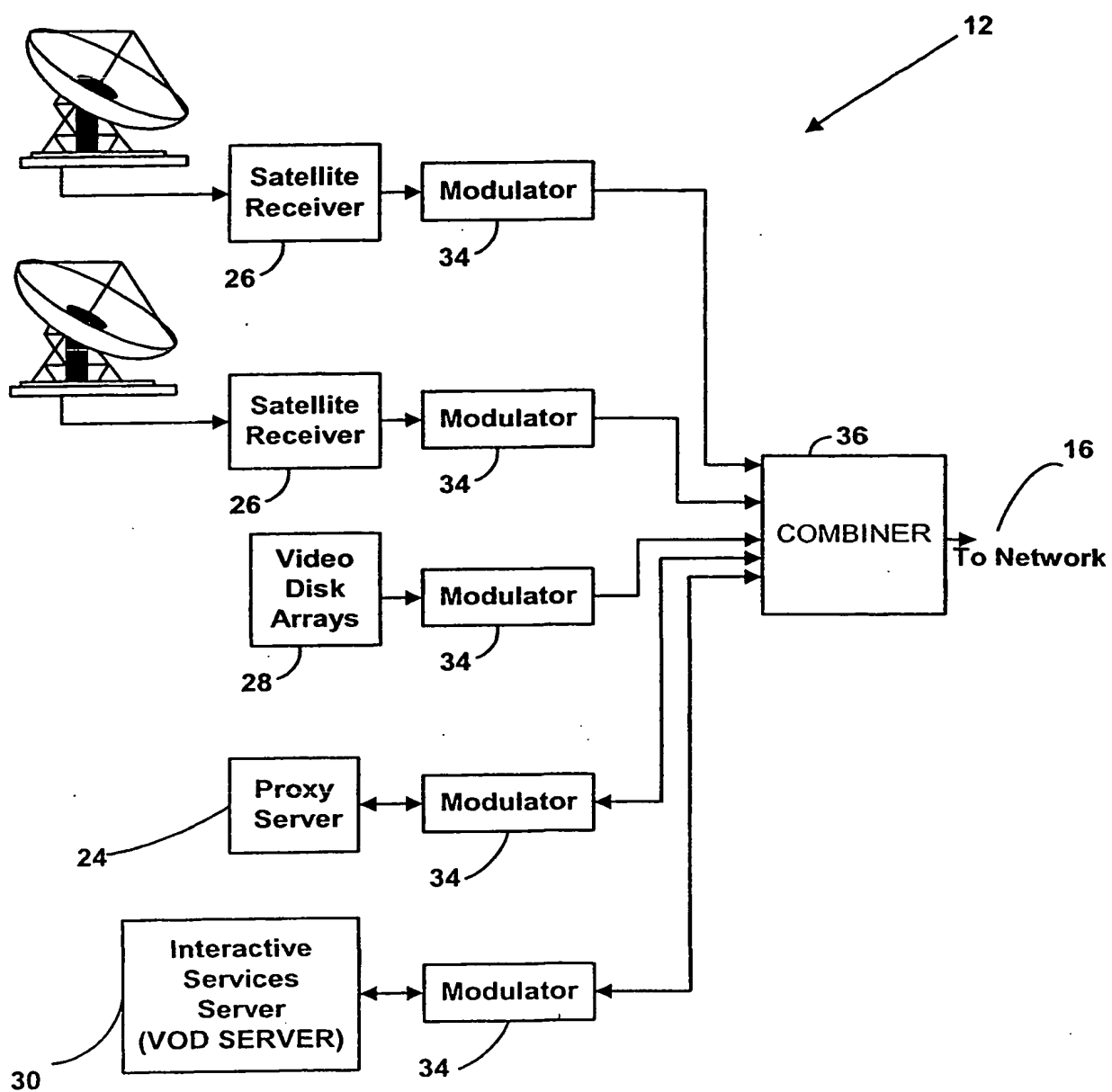


Fig. 5

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**Fig. 2**

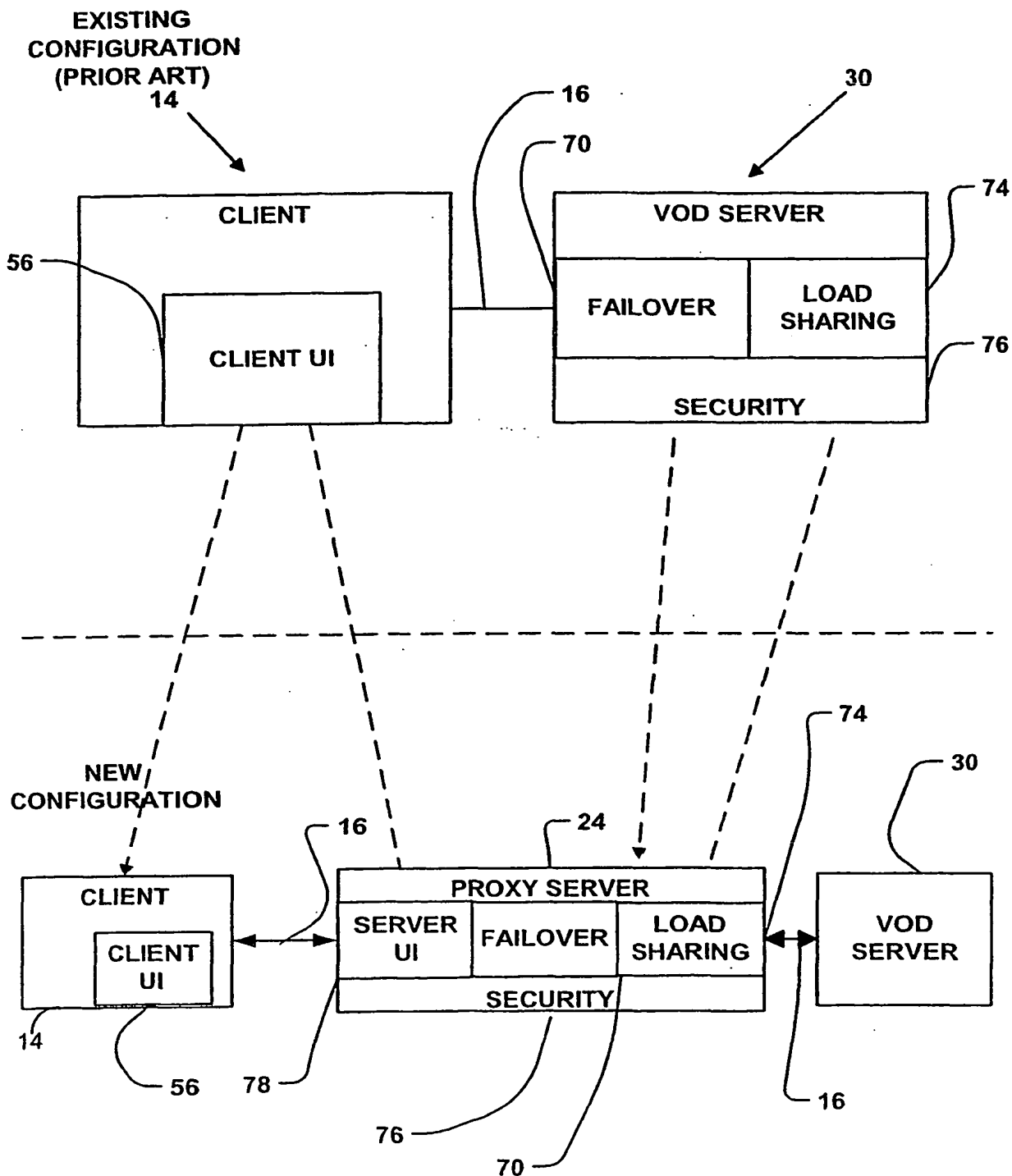


Fig. 3

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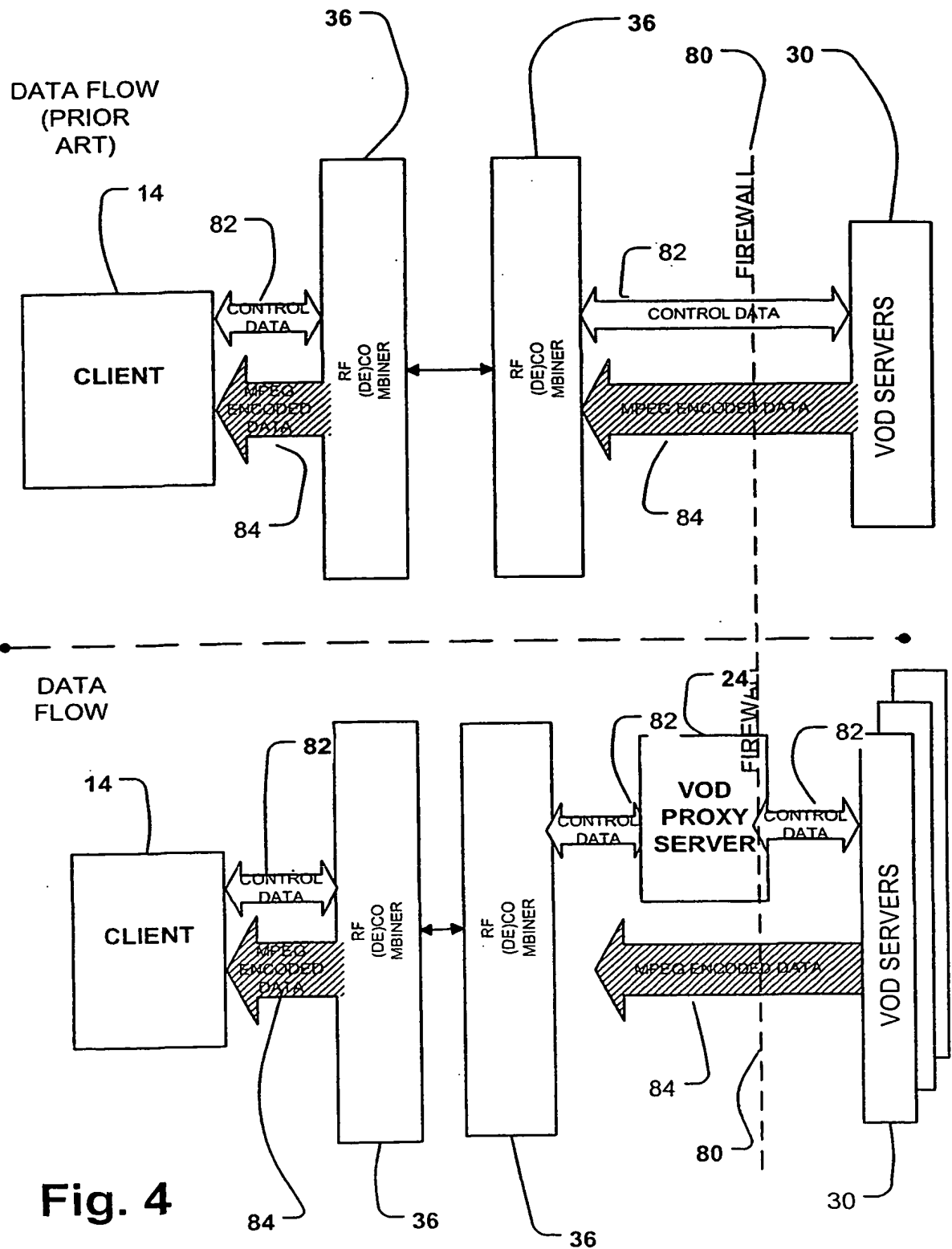


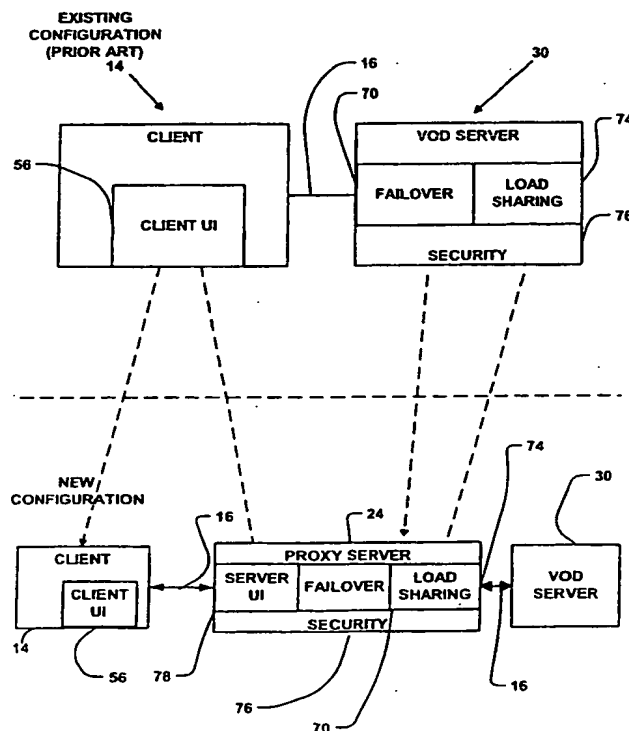
Fig. 4



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: <b>PCT/US99/28400</b> (22) International Filing Date: <b>30 November 1999 (30.11.99)</b> (30) Priority Data: 09/201,484      30 November 1998 (30.11.98)      US (71) Applicant: <b>MICROSOFT CORPORATION [US/US]; One Microsoft Way, Building 4, Redmond, WA 98052-6399 (US).</b> (72) Inventors: <b>CARPENTER, J., Wiltse ; 439 Elizabeth Street, San Francisco, CA 94114 (US). BRUCK, Timo; 1983-9 San Luis, Mountain View, CA 94043 (US). MIGHDOLL, Lee, S.; 801-B Wisconsin Street, San Francisco, CA 94107 (US). GOLDMAN, Phillip, Y.; 400 Fir Lane, Los Altos, CA 94024 (US).</b> (74) Agent: <b>SCOTTI, Robert, F.; Klarquist, Sparkman, Campbell, Leigh &amp; Winston, LLP, Suite 1600, One World Trade Center, 121 SW Salmon Street, Portland, OR 97204 (US).</b>			(81) Designated States: <b>AU, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</b>  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>  (88) Date of publication of the international search report: 23 November 2000 (23.11.00)

(54) Title: PROXY FOR VIDEO ON DEMAND SERVER CONTROL



(57) Abstract

A video on demand system includes a head-end coupled through a proxy server to plural client terminals. The proxy server performs (or cooperates with another component in performing) various functions, including user interface definition, security, system administration (e.g. channel management, load distribution, and failover), and protocol translation.

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/28400

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 H04L29/06 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L H04N G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, IBM-TDB

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	UBIK S: "POSSIBILITIES OF USING PROTOCOL CONVERTERS FOR NIR SYSTEM CONSTRUCTION" COMPUTER COMMUNICATIONS REVIEW, US, ASSOCIATION FOR COMPUTING MACHINERY. NEW YORK, vol. 27, no. 2, 1 April 1997 (1997-04-01), pages 37-48, XP000696917 ISSN: 0146-4833	1,2
A	page 37, left-hand column, line 1 -right-hand column, line 14 page 38, left-hand column, line 7 - line 32 page 39, left-hand column, line 16 -right-hand column, line 11 page 41, left-hand column, line 1 -right-hand column, line 32; figures 9,10 page 47, right-hand column, paragraph 8 --- -/--	2,4

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

27 September 2000

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/28400

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	NAMIHIRA D ET AL: "A MEDIA PROXY ARCHITECTURE FOR AN NFS-BASED VOD SERVICE ON THE INTRANET" IEEE PACIFIC RIM CONFERENCE ON COMMUNICATIONS, COMPUTERS AND SIGNAL PROCESSING, US, NEW YORK, NY: IEEE, vol. CONF. 6, 1997, pages 97-100, XP000804602 ISBN: 0-7803-3906-1	1-4
Y	page 98, left-hand column, line 6 -page 99, right-hand column, line 10	6,16
A	---	13
X	US 5 555 244 A (CHEN YU-REN B ET AL) 10 September 1996 (1996-09-10) abstract	1,2
Y	column 1, line 15 - line 20 column 1, line 42 - line 52	19
A	column 2, line 53 - line 56 column 7, line 30 - line 64	13
A	---	1-4
	LUDERER G W R ET AL: "DISTRIBUTED MULTIMEDIA USING CORBA" GLOBAL TELECOMMUNICATIONS CONFERENCE (GLOBECOM), US, NEW YORK, IEEE, 1996, pages 68-72, XP000742128 ISBN: 0-7803-3337-3 page 68, right-hand column, line 4 -page 70, right-hand column, line 33	1-4
X	---	5,7-10, 13
	DE JONG A ET AL: "A VOD Application Implemented in Java" MULTIMEDIA TOOLS AND APPLICATIONS, US, KLUWER ACADEMIC PUBLISHERS, BOSTON, vol. 5, no. 2, September 1997 (1997-09), pages 161-170, XP002129581 ISSN: 1380-7501	5,7-10, 13
Y	page 163, paragraph 3 -page 169, paragraph 7; figure 4	6,14-16
A	---	12
X	---	5,7-10, 13
	KERR G: "A REVIEW OF FULLY INTERACTIVE VIDEO ON DEMAND" SIGNAL PROCESSING. IMAGE COMMUNICATION, NL, ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM, vol. 8, no. 3, 1 April 1996 (1996-04-01), pages 173-190, XP000580000 ISSN: 0923-5965 page 177, paragraph 6 -page 179, left-hand column, line 8 page 18, left-hand column, paragraph 7.3 -right-hand column, paragraph 7.4 page 188, right-hand column, paragraph 10	5,7-10, 13
	---	
	-/--	



## INTERNATIONAL SEARCH REPORT

International Application No

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 798 899 A (NEDERLAND PTT) 1 October 1997 (1997-10-01) abstract ----	11
X	US 5 319 455 A (LAUDER GARY M ET AL) 7 June 1994 (1994-06-07) column 5, line 50 -column 6, line 59 column 8, line 15 - line 49	17,18
Y	column 11, line 29 -column 12, line 21 column 20, line 19 - line 35 claim 1 ----	19
A	DAN A ET AL: "CHANNEL ALLOCATION UNDER BATCHING AND VCR CONTROL IN VIDEO-ON-DEMAND SYSTEMS" JOURNAL OF PARALLEL AND DISTRIBUTED COMPUTING,US,ACADEMIC PRESS, DULUTH, MN, vol. 30, no. 2, 1 November 1995 (1995-11-01), pages 168-179, XP000537317 ISSN: 0743-7315 page 169, left-hand column, paragraph 2 -page 170, left-hand column, line 6 ----	17,18
A	WO 96 17306 A (ORACLE CORP) 6 June 1996 (1996-06-06) page 2, line 19 -page 3, line 5	20-23
Y	page 8, line 23 -page 9, line 16 page 10, line 21 -page 15, line 5 page 16, line 2 -page 17, line 19 page 26, line 3 -page 27, line 6 page 31, line 1 -page 33, line 22 ----	14,15
A	EP 0 845 906 A (IBM) 3 June 1998 (1998-06-03) page 5, column 7, line 7 -page 6, column 10, line 17 ----	20-23
A	BELLOVIN S M ET AL: "NETWORK FIREWALLS" IEEE COMMUNICATIONS MAGAZINE,US,IEEE SERVICE CENTER, PISCATAWAY, N.J., vol. 32, no. 9, 1 September 1994 (1994-09-01), pages 50-57, XP000476555 ISSN: 0163-6804 page 54, right-hand column, line 30 -page 55, left-hand column, line 55 ----- -/--	20,22

# INTERNATIONAL SEARCH REPORT

Int. National Application No

PCT/US 99/28400

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 95 15658 A (DISCOVERY COMMUNICAT INC)  8 June 1995 (1995-06-08)  abstract  page 4, line 28 -page 7, line 2  page 14, line 12 -page 15, line 11  page 23, line 16 - line 22  page 41, line 1 -page 42, line 26  page 43, line 8 -page 45, line 13</p>	24
A	<p>WO 98 44424 A (EL MAR SOFTWARE LTD ;MARMOR  ELIYAHU (IL)) 8 October 1998 (1998-10-08)  page 5, line 14 - line 30  page 9, line 13 - line 31  page 13, line 19 - line 26</p>	24

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 99/28400

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
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## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-4

Protocol converter proxy for Video-on Demand system

2. Claims: 5-16

Distributed user interface in a Video-on-Demand system.

3. Claims: 17-19

Channel assignment to clients of a Video-On-Demand system.

4. Claims: 20-23

Firewall and server allocation proxy in a Video-on-Demand system.

5. Claim : 24

Delivery of promotional video in a Video-on-Demand system.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/28400

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5555244	A	10-09-1996	AU 692551 B	11-06-1998
			AU 2511695 A	21-12-1995
			CA 2190590 A	07-12-1995
			CN 1151230 A	04-06-1997
			EP 0760186 A	05-03-1997
			JP 10501383 T	03-02-1998
			WO 9533309 A	07-12-1995
			US 5740176 A	14-04-1998
			US 5864542 A	26-01-1999
			US 5673265 A	30-09-1997
			US 5799017 A	25-08-1998
EP 0798899	A	01-10-1997	NL 1004167 C	23-10-1996
US 5319455	A	07-06-1994	US 5093718 A	03-03-1992
			US 5220420 A	15-06-1993
			AU 643828 B	25-11-1993
			AU 8483891 A	02-04-1992
			CA 2052477 A,C	29-03-1992
			CN 1063593 A	12-08-1992
			CS 9102869 A	13-05-1992
			EP 0477786 A	01-04-1992
			FI 914552 A	29-03-1992
			HU 63287 A	28-07-1993
			IL 99586 A	22-02-1998
			JP 6022315 A	28-01-1994
			MX 9101308 A	04-05-1992
			NO 913772 A	30-03-1992
			NZ 239969 A	22-12-1994
			PT 99110 A	31-12-1993
			TR 25669 A	01-07-1993
			US 5526034 A	11-06-1996
			US 6064377 A	16-05-2000
			US 5594507 A	14-01-1997
			US 5442700 A	15-08-1995
			US 5485197 A	16-01-1996
			US 5557316 A	17-09-1996
			US 5550578 A	27-08-1996
			US 5587734 A	24-12-1996
			US 5883661 A	16-03-1999
			US 6100883 A	08-08-2000
			US 5412720 A	02-05-1995
			US 5361091 A	01-11-1994
			ZA 9107555 A	28-04-1993
			PL 291975 A	05-04-1993
			US 6034678 A	07-03-2000
WO 9617306	A	06-06-1996	US 5805804 A	08-09-1998
EP 0845906	A	03-06-1998	CA 2222398 A	02-06-1998
WO 9515658	A	08-06-1995	US 5600364 A	04-02-1997
			US 5798785 A	25-08-1998
			AU 693148 B	25-06-1998
			AU 1430695 A	19-06-1995
			BR 9408211 A	26-08-1997
			CA 2177153 A	08-06-1995
			EP 0732031 A	18-09-1996

# INTERNATIONAL SEARCH REPORT

Information on patent family members

In International Application No

PCT/US 99/28400

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9515658 A		EP 0963116 A JP 9510327 T NZ 278185 A AU 1333795 A CA 2177154 A EP 0732027 A JP 9506225 T WO 9515649 A	08-12-1999 14-10-1997 27-04-1998 19-06-1995 08-06-1995 18-09-1996 17-06-1997 08-06-1995
WO 9844424 A	08-10-1998	AU 6417998 A EP 0976053 A	22-10-1998 02-02-2000